Analysis of cooked muscle meats for heterocyclic aromatic amine carcinogens

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Carcinogenic and mutagenic heterocyclic amines are natural products present at part-per-billion levels in muscle meats when they are cooked over 150°C. Using solid-phase extraction and HPLC with photo-diode array UV detection (Gross and Grüter, *J. Chromatography, 592*, 271), samples were analyzed for PhIP (2-amino-1-methyl-6-phenylimidazo[4,5-b]pyridine), MeIQx (2-amino-3,8-dimethylimidazo[4,5-f]quinoxaline), and DiMeIQx (2-amino-3,4,8-trimethylimidazo[4,5-f]quinoxaline). Quality control samples analyzed periodically over two years in a blind study show coefficients of variation to range from 0.24 to 0.40 for the compounds found, which are typical for part-per-billion analysis.

Amounts range from undetectable levels (less than 0.1 ppb) when meats are boiled, microwave cooked, and baked, to hundreds of ppb for frying/grilling at high meat surface temperatures. Ground meats have lower amounts of heterocyclic amines than intact muscle pieces of the same size cooked identically. Chicken breast meat samples showed surprisingly high levels of PhIP (>50 ppb) when cooked over open flames compared to beef cooked similarly. Beef and chicken appear to form more of the heterocyclic amines than fish, in part due to traditional cooking practices. The significance of the human intake of these ppb amounts of carcinogens needs to be determined.

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